



Implicit need for achievement moderates the relationship between competence need satisfaction and subsequent motivation [☆]

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ABSTRACT

Self-determination theory (SDT) proposes that all humans have a need for competence. But is this need modulated by individual differences? Our research integrated SDT, which defines psychological needs (including competence) as universally essential experiences, and motive disposition theories, which define psychological needs as individually varying non-conscious motives. A cross-sectional and a longitudinal study showed that felt competence in a sports activity has especially positive effects on subsequent flow and intrinsic motivation for individuals high in the need for achievement. Study 3 showed that felt competence more strongly influences subsequent academic goal motivation for those high in the need for achievement. Discussion focuses on the importance of integrating universalist and individual difference approaches to motivation, to derive the most complete understanding.

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1. Introduction

Positive forms of motivation such as intrinsic motivation, flow and a high commitment to one's personal goals are connected to positive outcomes such as well-being and performance, and therefore their prediction is the aim of a variety of theories (Brunstein, Schultheiss, & Grässmann, 1998; Csikszentmihalyi, Abuhamdeh, & Nakamura, 2005; Deci & Ryan, 1985). However, these theories are often unconnected so far and synergies that could result from an integrative perspective remain unused. The present research attempted to integrate two influential theories of human needs, in order to predict optimal situational motivation. The first is the basic need approach proposed by self-determination theory (SDT; Deci & Ryan, 1985, 2000). Here, the psychological needs for autonomy, competence and relatedness are conceptualized as innate basic requirements of all human beings that, when fulfilled, lead to intrinsic motivation and well-being. The main focus of SDT research has been to measure the level of need-satisfaction currently experienced, and to use these variations to predict variations in positive outcomes such as intrinsic motivation and mood.

The second approach to human needs is the motive dispositions approach, as for example represented in McClelland and colleague's research tradition (McClelland, 1985). Here, human needs

(also called implicit motives) such as the needs for achievement, affiliation and power are conceptualized as early acquired and relatively stable motive dispositions that vary from person to person. The main focus of this research approach has been to measure individual differences in particular needs, typically via projective methodologies such as the Thematic Apperception Test (TAT; Murray, 1943), and to use these variations to predict variations in perception and behavior.

Although these two research approaches define psychological needs differently, they still deal with related topics. For example, the need for competence according to SDT involves the importance of experiencing oneself as able and effective in dealing with the environment (Sheldon, Elliot, Kim, & Kasser, 2001) and the need for achievement according to the motive dispositions approach involves the recurrent desire to “become better” and to improve one's skills while successfully interacting with the environment (McClelland, Atkinson, Clark, & Lowell, 1953). Despite their obvious thematic similarity there have been few attempts to integrate these traditions so far. The present research asked whether individual differences in the need for achievement amplify the predictive power of competence need satisfaction on intrinsic and goal motivation. Below, the main assumptions of the two approaches will be briefly summarized.

1.1. Basic needs within the SDT approach

SDT researchers define intrinsic motivation as “doing a behavior because the activity itself is interesting and spontaneously

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satisfying. When intrinsically motivated, people perform activities because of the positive feelings resulting from the activities themselves" (Deci & Ryan, 2008, p. 15). Given the importance of intrinsic motivation for many positive outcomes, it is important to know how to support it. According to SDT, intrinsic motivation within a context tends to be enhanced when people get their psychological needs met within that context – specifically, then they feel autonomous, competent, and related (Deci & Ryan, 2000). The need for autonomy “concerns people’s universal urge to be causal agents, to experience volition, to act in accord with their integrated sense of self (i.e., with their interests and values)” (Deci & Vansteenkiste, 2004, p. 25). The need for competence is fulfilled when people feel that they are capable and effective in their actions rather than feeling incompetent or ineffective (Sheldon et al., 2001). The need for relatedness is the desire to feel connected to others, to care for others and to feel cared for by others (Baumeister & Leary, 1995).

Deci and Ryan (1985, 2000) conceptualized basic needs as innate rather than learned. The conceptualization of basic needs as “psychological nutrients that are essential for ongoing psychological growth, integrity, and well-being” (Deci & Ryan, 2000, p. 229) implies that their satisfaction “constitutes the central psychological process through which intrinsic motivation, the integrative tendency, and intrinsic goal pursuits are facilitated, resulting in well-being and optimal development” (Deci & Vansteenkiste, 2004, p. 26). In contrast, the frustration of basic needs leads to negative outcomes as for example impaired intrinsic motivation, well-being, health and work performance (e.g., Deci & Moller, 2007; Deci & Ryan, 1985, 2008; Illardi, Leone, Kasser, & Ryan, 1993). Social environments that facilitate the satisfaction of the basic needs support individuals’ natural tendencies to be active and to find sources of intrinsic motivation. In contrast, social contexts that thwart the basic needs, as for example controlling environments, hinder peoples’ natural intrinsic motivation.

An impressive number of studies have confirmed the relationship between the needs for autonomy, competence, and relatedness and resultant intrinsic motivation and well-being across different domains of human life (e.g., Baard, Deci, & Ryan, 2004; Deci & Ryan, 2000; Illardi et al., 1993; Kasser & Ryan, 1999; Pelletier, Fortier, Vallerand, & Brière, 2001; Sheldon & Krieger, 2007). For example, positive feedback, which satisfied people’s need for competence, enhanced intrinsic motivation (Deci, 1971), whereas negative feedback thwarted felt competence satisfaction and decreased intrinsic motivation (Vallerand & Reid, 1984; Vansteenkiste & Deci, 2003).

1.2. Needs within the motive disposition approach

According to the motive disposition approach, situational motivation is the consequence of a dispositional need interacting with an appropriate cue in the environment (or incentive) (cf. Beckmann & Heckhausen, 2008; McClelland, 1985; Schneider & Schmalz, 2000). Dispositional needs are conceptualized as acquired preferences for certain kinds of incentives (e.g., Atkinson, 1957; McClelland, Koestner, & Weinberger, 1989; Murray, 1943; Schneider & Schmalz, 2000; Winter, 1973) and represent the “capacity to experience the attainment of a certain type of incentive as rewarding; as a consequence, it orients the individual towards cues related to the incentive and energizes and selects behavior aimed at incentive attainment” (Schultheiss & Hale, 2007, p. 13).

The motive disposition approach mainly focuses on three motives, namely, the need for achievement (McClelland et al., 1953), the need for affiliation (McAdams & Bryant, 1987) and the need for power (McClelland, 1985; Winter, 1973). The achievement motive is the recurrent concern with surpassing standards of excellence (McClelland et al., 1953). The affiliation motive is defined as “the desire to establish and/or maintain warm and friendly

interpersonal relations” (French & Chadwick, 1956, p. 296) and is incentivized by the pleasure of being with other persons and exchanging contact with them (McClelland, 1987). The power motive is the desire to influence other persons, for example by arousing strong emotions in others and to gain and maintain reputation and prestige (Winter, 1973).

The central assumption of the motive disposition approach is that motives differ in strength as a function of differences in early childhood learning and that these differences explain differences in the sensitivity toward certain kind of incentives and differences in behavior (for a summary see Schultheiss & Hale, 2007). Individuals with a high need for achievement are very sensitive to the opportunity to do something better than before or than others and to improve skills (Brunstein & Heckhausen, 2008; McClelland, 1985). As a consequence they prefer challenging goals of moderate difficulty from which they get realistic feedback about their level of performance and ability (Atkinson, 1957). For them, the striving for and attainment of achievement goals are accompanied by positive emotions such as enjoyment and proud. In contrast, the same class of situations is said to be much less attractive for individuals with a low achievement need. Additionally, low need for achievement individuals do not feel as many positive emotions while striving for and attaining the achievement goal. That is, they differ from high achievement motivated individuals in the capacity of getting satisfaction from seeking and attaining a particular type of incentive (e.g., competence feeling) (McClelland, 1985; see also Brunstein et al., 1998).

An important theoretical distinction is between implicit and explicit motives which differ in terms of their developmental history, the incentives that arise the motives and the behavioral correlates (Brunstein, 2008; McClelland et al., 1989). Implicit motives are said to be non-conscious and therefore are measured with projective (e.g., TAT; Murray, 1938) or semi-projective measures (MMG; Sokolowski, Schmalz, Langens, & Puca, 2000), whereas explicit motives are consciously represented self-attributes and can be measured by participants’ self-reports for example by using the Personality Research Form (PRF; Jackson, 1984).

1.3. Basic needs and individual motive differences

So far, there has been little research that integrates the SDT and the motive disposition approaches to human needs in order to predict subsequent motivation. Additionally, there are at least two contrary theoretical positions regarding personality variables as moderators of the basic need satisfaction–outcome relationship. On the one side, viewing needs as universal and innate, Deci and Ryan focus on environmental conditions that facilitate or hinder the satisfaction of basic needs which increase or decrease intrinsic motivation, rather than focussing on variations in need strength. Deci and Ryan (2000) acknowledged that people might vary in need-strengths, but nevertheless came to the conclusion that “Although there may be individual differences in the strength of people’s needs for competence, autonomy, and relatedness, we believe that these innate differences are not the most fruitful place to focus attention” (Deci & Ryan, 2000, p. 232). On the contrary, Vallerand (2000) disagreed regarding this issue and stated that individual differences in psychological needs are important to consider, because they could give information on the motivational processes underlying the relationship between basic need satisfaction and its positive consequences. This assumption was supported by a study by Richer, Blanchard, and Vallerand (2002) in the affiliation domain showing that the relationship between social factors and motivation was mediated by the perception of relatedness and that this mediational relationship was moderated by the strength of the participants’ dispositional need for relatedness. They concluded that “individual differences in needs may serve various

functions, including that of determining which type of perceptions (autonomy, competence, relatedness) will influence motivation" (Vallerand, 2000, p. 316). Harackiewicz and colleagues (Harackiewicz, Sansone, & Manderlink, 1985) found that participants high and low in the achievement motive responded differently (regarding task interest) to positive competence feedback which can be interpreted as need for competence satisfaction. However, further research is needed to shed light on the role of motives as moderators of the basic need satisfaction–outcome relationship.

1.4. Present research

The present research aims at combining the main assumptions of SDT and the motive disposition approach in order to predict subsequent motivation. We chose to focus upon the achievement domain in particular, because it has received the most attention within the motive disposition approach (McClelland, 1985). In accordance with SDT we hypothesized that feeling competent satisfies an important human need and therefore will be associated with intrinsic motivation at a main-effects level (hypothesis 1).

However, in accordance with the motive disposition research, we hypothesize that feeling competent has stronger effects for individuals with a higher need for achievement. Feeling competent ideally matches the desire of highly achievement motivated individuals to surpass a standard of excellence (McClelland, 1985) and therefore should produce the most intrinsic motivation to continue doing the activity in question. Conversely, the lack of felt competence (basic need thwarting), is more aversive to highly achievement motivated individuals and should produce low intrinsic motivation to continue doing the activity. In contrast, for individuals low in the need for achievement, feeling competent is expected to be somewhat less relevant and less predictive of subsequent motivation for that activity.

We employed the Multi-Motive-Grid (MMG; Sokolowski et al., 2000), which measures implicit motives using an elegant and simple procedure which combines the advantages of projective and self-report measures. Motive-relevant pictures were presented with the aim to arouse participant's motives similar to the TAT (Murray, 1938, 1943) procedure. In contrast to the TAT measure, participants do not write down a complete story that later has to be coded by raters but answer statements that were presented along with the pictures. Because participants do not rate their own motives but instead project the motive-relevant statements upon the situation illustrated in the picture, their unconscious motives can be measured (e.g., Gable, Reis, & Elliot, 2003; Puca & Schmalz, 2001; Schmalz, 1999; Sokolowski et al., 2000).

We conducted three studies to test the hypothesized interaction between the implicit need for achievement and felt competence, examining several measures of optimal situational motivation (flow experience, intrinsic motivation, goal commitment, goal progress), in both sport and academic domains.

2. Study 1

Study 1 used rated flow experience to operationalize optimal motivation. The flow experience is defined as a state "...that people report when they are completely involved in something to the point of forgetting time, fatigue, and everything else but the activity itself" (Csikszentmihalyi & Rathunde, 1992, p. 59). Phenomenologically, it is a prototype of intrinsic motivation in which people feel totally involved in an activity and perform it for its own sake. According to Csikszentmihalyi (1990), flow experience results from an optimal balance of personal skills and task difficulty that enables people to act in a full sense of competence and control. Whereas the perceived lack of skills to manage the challenge of an activity leads

to anxiety, being too skilled leads to boredom. The flow experience is conceptualized as a multifaceted phenomenon that includes full concentration on the task at hand, a high sense of control, a merging of action and awareness and an altered sense of time (Csikszentmihalyi et al., 2005). Due to the flow experience's rewarding experiential quality (Csikszentmihalyi et al., 2005) and its positive consequences for well-being (e.g., Csikszentmihalyi & LeFevre, 1989; Schüler, 2007) and performance (e.g., Csikszentmihalyi, Rathunde, & Whalen, 1993; Engeser, Rheinberg, Vollmeyer, & Bischoff, 2005), it is important to examine its determinants.

Again, in line with SDT research our first hypothesis was that flow experience is stronger for individuals whose need for competence is better satisfied. Secondly, we expected that this relationship would be moderated by the implicit need for achievement. Individuals with a high need for achievement were expected to report higher differences in flow depending on whether they feel competent or not than participants with a low need for achievement. Low achievement motivated individuals were also expected to show a significant benefit from feeling competent compared to not feeling competent (see hypothesis 1), but to a lesser degree than individuals with a high achievement motive.

Ryan and Deci (2000) criticized previous studies that have examined self-reported motive as moderators (see above, Harackiewicz et al., 1985; Richer et al., 2002), stating that "part of the problem with assessing need strength as a moderator of the effects of satisfying the need also results from confusion between needs and their conscious representations" (Deci & Ryan, 2000, p. 328). Self-reported motives, which are conscious reflections about what a person needs that can be influenced by demands of the social environment and by inaccurate self-theories, may not do the job of capturing "deep" motive dispositions and predicting how they moderate the effects of different types of experiences. In contrast, implicit motives better represent ingrained preferences than explicit motives, because implicit motives are based on affect (rather than on cognition as are explicit motives), are developed early in life as a function of early rewarding experiences (rather than being formed by later self-presentational processes), and are associated with intrinsic rather than explicit forms of motivation (see Brunstein, 2008). However, Deci and Ryan's criticism was made on conceptual and not empirical grounds, and some research has shown the hypothesized moderator effect using self-report motive measures (Harackiewicz et al., 1985). In order to empirically address this issue we measured achievement motives via both explicit and implicit methodologies, and hypothesized for theoretical reasons that the competence \times achievement moderator effect would be found only for the implicit achievement motive.

3. Method Study 1

3.1. Participants and procedure

One-hundred and one undergraduate students at an American University took part in a study on "experiences in sports" in return for course credit. They were recruited at the end of a semester from university sport courses such as fitness-, tennis- and gymnastics courses. The sample comprised 87 women and 23 male with a mean age of 20.2 years ($SD = 4.0$). Participants completed a web-based survey that contained the implicit and explicit motive measures and also asked them to rate their feelings of competence and flow experience regarding the relevant sports activity.

3.2. Measures

The *satisfaction of the need for competence* was measured with six items of the Basic Satisfaction of Needs Scale (e.g., Gagné,

2003; Kashdan, Julian, Merritt, & Uswatte, 2006) that was slightly adapted to the sport context (e.g., “Most times in doing my sport activity I felt a sense of accomplishment from what I do”). Participants were asked to refer the items to their sport courses in the current semester and responded to the items using a rating scale from 1 (not at all true) to 7 (very true) (Cronbachs' Alpha = .75.).

The *implicit need for achievement* was measured with the Multi-Motive-Grid (MMG; Sokolowski et al., 2000) which measures the hope and fear components of the achievement, affiliation and power motives. The MMG consists of 14 line drawings of everyday situations which are presented along with statements describing various thoughts, feelings, and action-tendencies that participants had to rate regarding whether they fit with the situation or not. Participants are told that the pictures depict everyday situations and that they are not very clear and detailed because participants should use their imagination in guessing what might be going on in these pictures. They are informed that the experimenter is interested in the different ways people experience different situations and are asked to decide for each statement presented below the picture whether it describes the situation. If it does, participants should check “Yes”, if it does not, they should check “No”. They are asked to follow their spontaneous impressions and not to think to long about one statement. Examples of pictures are a person taking a test, a rope climber and a work group. Examples of achievement items are, “Feeling confident to succeed at this task” (hope of success) and “Thinking about lacking abilities at this task” (fear of failure). By using pictures to stimulate the motives, the MMG uses the same technique (apperception) as the TAT and therefore measures implicit motives. However by using pre-specified statements that participants have to rate, the motives can be assessed more consistently and more easily than with the time-consuming TAT-scoring procedure.

Still, one might criticize that using statements that have to be rated “explicitly” distorts the implicit character of the measure. This is unlikely due to four reasons. First and most importantly, Schmalt (1999) and Sokolowski et al. (2000) argued that in rating the persons in the picture (rather than themselves) participants project their non-conscious motives into the situation, bypassing their explicit theories about themselves. Secondly, in contrast to the items used within explicit motive measures that usually present descriptions of “your typical behavior,” the MMG statements represent motivational tendencies in terms of cognitions, goal-anticipation, and emotions that are consistent with the coding categories used in the TAT (and that would be scored as motive relevant if written in TAT stories as for example using the coding system of McClelland et al., 1953). Third, correlations between MMG motives and explicit motives for example measured by the Personality Research Form (PRF) are typically low (Sokolowski et al., 2000). Fourth, the MMG predicts task enjoyment and intrinsic motivation which are theoretically associated with implicit rather than explicit motives (Deci & Ryan, 2000).

Meanwhile, the validity of the MMG as an implicit motive measure has been repeatedly demonstrated (e.g., Gable, 2006; Gable et al., 2003; Kehr, 2004; Langens & Schmalt, 2002; Puca, 2005; Puca, Rinkenauer, & Breidenstein, 2006; Puca & Schmalt, 1999, 2001; Schüler, 2007). For example, the need for achievement assessed by the MMG predicted optimism (Puca & Schmalt, 2001) and performance in achievement contexts (Puca & Schmalt, 1999). The power motive is associated with leadership success (Sokolowski & Kehr, 1999) and the affiliation motive predicted affiliation relevant behavior (Sokolowski et al., 2000). Furthermore, the hope and fear subscales predicted positive and negative well-being, respectively (Gable, 2006; Langens & Schmalt, 2002; Langens & Schüler, 2005).

In traditional motivational theory, the positively valenced component (e.g. hope of success) and the negatively valenced compo-

nent (e.g., fear of failure) of the implicit motive are both assumed to contribute to people's affect, motivation and behavior and thus both have to be considered in order to improve the predictive power of the motive score (Atkinson, 1964; Atkinson & Feather, 1966; McClelland, 1992). For example, in Atkinson's (1957) risk-taking model, achievement behavior is predicted by considering hope of success (an approach tendency that energizes behavior toward optimally challenging tasks) as well as fear of failure (an avoidance tendency that causes people to choose either very easy or very difficult tasks). In order to take both factors into account, Atkinson computed a difference score of hope minus fear, which he called the “resultant tendency” (Atkinson, 1964; Atkinson & Feather, 1966; McClelland, 1992). Based on Atkinson's reasoning, we assumed that fear of failure detracts from the positive effects of hope of success on subsequent motivation. This assumption is also in line with findings that fear is antithetical to flow experience (Csikszentmihalyi, 1990; Jackson, 1995) and undermines intrinsic motivation (Deci & Ryan, 1985). Thus, we used a difference score approach by subtracting the z-transformed fear of failure score of the MMG (Cronbach's Alpha = .79) from the hope of success score (Cronbach's Alpha = .68). This and similar overall measures of motives have been shown to be highly valid in the achievement (Puca, 2005; Puca & Schmalt, 2001; Schüler, 2007) and the affiliation domain (Schüler, Job, Fröhlich, & Brandstätter, 2008). In the present study, Cronbach's Alpha for the hope of success items and the recoded fear of failure items was .80, indicating a high reliability of the overall measure (Cronbachs' Alpha for hope of success, HS: .68; fear of failure, FF: .79; Pearson correlation HS and FF = .35, $p < .001$).

To measure the *explicit need for achievement* we used the achievement scale of a German version of Jackson's (1984) Personality Research Form (Stumpf, Angleitner, Wieck, Jackson, & Beloch-Till, 1985). Participants' could agree or disagree with 12 achievement statements as for example “My goal is to do at least a little bit more than anyone else has done before.” After recoding items, an explicit achievement motive index was computed by summing the number of agreed-with items (Cronbach's Alpha = .70).

The 10-item *Flow Short-Scale* (Rheinberg, Vollmeyer, & Engeser, 2003) was administered to measure flow experience, the dependent measure. It consists of the two subscales of being absorbed by action (“I do not recognize that time is going by”; Cronbach $\alpha = .72$) and feeling automaticity in action (“I feel that everything is under control”; Cronbach $\alpha = .88$). Participants were asked to rate whether they agree with each item regarding to the sport courses they took part in the current semester (1: no agreement to 7: full agreement). In addition to the two flow subscale scores, an average score of flow experience was computed (Cronbach $\alpha = .90$; for this procedure see also Rheinberg & Vollmeyer, 2003).

4. Results

4.1. Preliminary analyses, descriptive statistics and correlations

Preliminary analyses revealed that neither age nor sex of participants influenced the results reported below, thus these subject variables will not be considered further. In accordance with the first hypothesis, correlational analyses showed a significant relationship between the satisfaction of need for competence ($M = 4.83$, $SD = 1.02$) and flow experience ($M = 4.72$, $SD = 1.08$), $r = .61$ ($p < .01$). Neither the implicit need for achievement ($M = .88$, $SD = 4.25$) nor the explicit need for achievement ($M = 10.24$, $SD = 3.06$) were significantly correlated with need for competence satisfaction (implicit: $r = .15$, ns ; explicit: $r = .02$, ns) and flow (implicit: $r = .13$, ns ; explicit: $r = -.09$, ns). In accordance with typical findings (e.g., McClelland et al., 1989), the implicit

Table 1
Hierarchical regression of flow experience on need for competence satisfaction and the implicit achievement motive (upper part of table) and on need for competence satisfaction and the explicit achievement motive (lower part) (Study 1).

Step	Variable	ΔR^2	df	ΔF	b^a
1	Main effects	.38	2, 97	29.36***	
	Need for competence satisfaction (NC)				.63***
	Implicit achievement motive (ACH)				-.02
2	NC \times ACH	.04	1, 97	7.26**	.21**
	Cumulative R^2	.42	3, 97	23.24***	
1	Main effects	.38	2, 97	30.71***	
	Need for competence satisfaction (NC)				.62***
	Explicit achievement motive (ExACH)				-.11
2	NC \times ExACH	.00	1, 97	.07	.02
	Cumulative R^2	.39	3, 97	20.23***	

^a b is the standardized regression coefficient in the regression equation.

** $p < .01$.

*** $p < .001$.

and explicit need for achievement measures were unrelated ($r = .13, ns$).

4.2. Moderation analyses

In order to examine if and how the implicit need for achievement moderated the effect of competence need satisfaction on flow experience a hierarchical regression analysis was conducted. After centering continuous variables (as suggested by Cohen, Cohen, West, & Aiken, 2003), the implicit need for achievement score and the competence satisfaction score were entered into the regression equation (Step 1), followed by the multiplicative interaction of the two variables (Step 2) (Table 1, upper part). As expected by hypothesis 1, the main effect of felt competence reached significance in the prediction of flow, $b = .63, se_b = .08, p < .001$. Also the interaction of felt competence and implicit need for achievement significantly predicted flow, $b = .20, se_b = .07, t(97) = 2.69, p < .01$.

To explore the nature of this interaction, we used a procedure proposed by Cohen et al. (2003), in which values at one standard deviation above or below the mean of the predictor variables are entered in the regression equation. The interaction illustrated in Fig. 1 shows that individuals high in the need for achievement

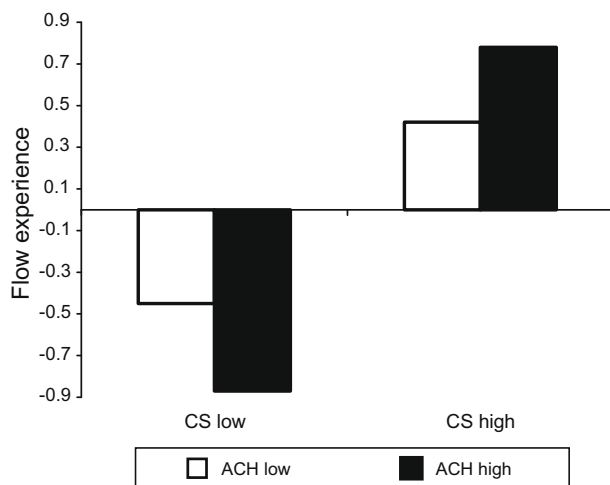


Fig. 1. Flow experience as a function of the need for competence satisfaction (CS) and implicit achievement motive (ACH) (Study 1).

who feel competent report higher flow compared to individuals who do not feel competent and compared to low achievement motivated individuals with high competence satisfaction. The figure also shows that high achievement motivated individuals reported the lowest flow of all when their need for competence was not fulfilled. Supplementary analyses revealed a very similar interaction pattern when considering the flow subscales separately, rather than using the aggregated flow score (automaticity in action: $\beta = .23, b = .21, se_b = .08, t(97) = 2.84, p < .01$; being absorbed by action: $\beta = .16, b = .15, se_b = .08, t(97) = 1.90, p = .06$).

In order to test whether the explicit need for achievement measure also functioned as a moderator, we repeated the hierarchical regression analysis using the explicit instead of the implicit measure. Here, the regression of flow revealed no significant felt competence \times need for achievement interaction ($b = .02, se_b = .06, t(97) = .26, ns$) (see lower part of Table 1).

5. Brief discussion

The results confirmed our first hypothesis that participants whose need for competence was satisfied reported more flow than participants whose need for competence was not satisfied. This replicates the well-known positive effects of basic need satisfaction on optimal motivation reported in previous SDT research. The present results contribute to this research by showing that these effects are moderated by individual differences in the implicit need for achievement. Besides the finding that individuals high in the need for achievement benefited more from feelings of competence than individuals low in the achievement motive, we also learned that the former suffered more from need frustration than the latter.

Finally, as hypothesized, only the implicit need for achievement, but not the explicit need for achievement affected the link between feelings of competence and resultant feelings of flow. This is in line with the theoretical considerations on the characteristics of implicit and explicit motives reported above, but nevertheless contradicts the findings of a previous study in the achievement domain conducted by Harackiewicz et al. (1985) which revealed that explicit achievement motivation moderates the relation between competence need satisfaction and intrinsic interest (see above). One possible explanation for these discrepant findings is that Harackiewicz's design was especially activating of explicit motivation, in that adolescent students were being given performance evaluations on an achievement task. Additionally, social comparison information was salient (e.g., the experiment was conducted in group sessions, and participants were asked how well they would do in comparison to other students). Social evaluation norms are known to be associated with self-presentational motives (Brunstein, 2008) and are assumed to hinder rather than facilitate intrinsic motivation (Deci & Ryan, 2000). In contrast, our methodologies were web surveys which did nothing to activate appearance or social comparison concerns. Another difference is that Harackiewicz et al. did not measure feelings of competence directly, but rather inferred such feelings based on the type of manipulated performance feedback that was given. Further research is needed to examine the extent that different social and measurement contexts affect the relative predominance of implicit and explicit motives within those contexts; however, based on our Study 1 finding, in Studies 2 and 3 we will use implicit measures only.

6. Study 2

In Study 2 we tested whether the felt competence \times implicit need for achievement interaction also predicts intrinsic motivation (and not just flow). We assessed feelings of competence using a

different measure in order to ensure generalizability. The most important added value is that Study 2 was designed as a longitudinal study in which we collected data at the beginning and at the end of a semester. We first analyzed the data on a cross-sectional basis in order to replicate the primary results of Study 1. Extending these results, we also hypothesized that changes in need for competence satisfaction from the beginning to the end of the semester correspond with changes in intrinsic motivation (hypothesis 1), especially for those high in the need for achievement (hypothesis 2).

7. Method Study 2

7.1. Participants and procedure

Seven-hundred and fourteen students and alumni who planned to take part in sport courses such as aerobic, tennis and gymnastics, offered by a sport organization at a Swiss university in the forthcoming semester, were invited to participate in a two-part web survey. At the beginning of the semester (T1) participants were asked to complete the implicit achievement motive measure and the competence satisfaction measure. They also completed an intrinsic motivation questionnaire regarding the experience of exercising in the sport courses. Six-hundred and eighty-five undergraduates (403 female; age: $M = 32.00$, $SD = 9.90$) also completed the second part of the web survey at the end of the semester (T2) and their data sets were included in the analyses reported below. The second survey contained the second repeated measures of competence satisfaction and intrinsic motivation.

7.2. Measures

Competence need satisfaction was measured with a shortened version of the need for competence scale of the Psychological Need Satisfaction in Exercise Scale (PNSE; Wilson, Rogers, Rodgers, & Wild, 2006). The English scale was translated into German by the first author and was back-translated by an English native speaker. The back-translated scale differed from the original scale in one minor point that was discussed by the native speaker and the first author. The German word which was responsible for the translation differences was replaced by a more appropriate word. For practical reasons the original scale had to be shortened. We choose four items that best represented the scale according to a factor analyses done by the test authors (Wilson et al., 2006). The items (e.g., "Capable of doing challenging exercises") had to be rated according to whether participants agree with the item using a Likert scale ranging from 1 (not at all) to 6 (very much) and the need for competence was highly reliable with Cronbach's Alpha = .85 at T1 and T2.

The *implicit need for achievement* was again measured using the Multi-Motive-Grid (MMG; Sokolowski et al., 2000) and again showed sufficient reliabilities (Cronbach's Alpha for hope of success: .73; fear of failure: .67; Pearson correlation HS and FF = .13, $p < .01$). Cronbach's Alpha of the overall measure after recoding the fear of failure items was .62.

Intrinsic motivation was assessed using the intrinsic motivation scales of the Sport Motivation Scale (SMS, Pelletier et al., 1995) (e.g., "For the pleasure I feel in living exciting experiences"). Three items each from the intrinsic motivation to know scale, the intrinsic motivation to accomplish things scale and the intrinsic motivation to experience stimulation scale were chosen for the study and were aggregated to an overall mean score of intrinsic motivation. Participants rated their agreement using a 7-point scale (1: not at all to 7: very much) (Cronbach's Alpha = .91 at T1 and .92 at T2).

8. Results Study 2

8.1. Preliminary analyses, descriptive statistics and correlations

Neither age nor sex of participants influenced the results reported below. Correlation analyses showed that need for competence satisfaction at T1 ($M = 5.03$, $SD = .80$) and at T2 ($M = 4.88$, $SD = .79$) positively correlated with the implicit achievement motive ($M = 3.13$, $SD = 3.45$), $r = .11$ ($p < .05$; T1) and $r = .10$ ($p < .05$; T2) and with intrinsic motivation at T1 ($M = 4.81$, $SD = 1.32$), $r = .37$ ($p < .001$; T1) and $r = .28$ ($p < .001$; T2) and with intrinsic motivation at T2 ($M = 4.74$, $SD = 1.28$), $r = .33$ ($p < .001$; T1) and $r = .40$ ($p < .001$; T2). The implicit motive was uncorrelated with intrinsic motivation at both time of measurement (T1: $r = .03$, *ns*; T2: $r = .04$; *ns*). Intrinsic motivation at T1 and at T2 were highly correlated, $r = .65$, $p < .001$.

8.2. Cross-sectional moderation analyses

In order to replicate the cross-sectional moderation effect we found in Study 1 (our second hypothesis), we employed the same hierarchical regression procedure and used the data collected at the end of a semester (as in Study 1). To examine the effects on intrinsic motivation at T2, we entered T2 competence satisfaction (CS) and the implicit need for achievement (ACH) as a first step into the regression equation, followed by the CS \times ACH interaction term (Step 2). As expected, a main effect of felt competence emerged, $\beta = .40$, $b = .40$, $se_b = .04$, $\Delta R^2 = .16$, $p < .001$. Additionally, the interaction of felt competence and need for achievement predicted intrinsic motivation, $\beta = .10$, $b = .10$, $se_b = .04$, $\Delta R^2 = .01$, $t(681) = 2.87$, $p < .01$. The interaction pattern was similar to that of Study 1: High implicit need for achievement participants reported more intrinsic motivation than individuals low in the implicit achievement motive when they felt competent. Additionally, they were more intrinsically motivated when their need for competence was fulfilled rather than when it was thwarted.

In order to test the robustness of the cross-sectional moderation effect, we conducted the same regression analysis with the T1 measures. The regression of intrinsic motivation at T1 on competence satisfaction at T1 and the implicit need for achievement as Step 1 and the CS at T1 \times ACH as Step 2 revealed a significant main effect of felt competence at T1, $\beta = .37$, $b = .36$, $se_b = .03$, $\Delta R^2 = .14$, $p < .001$. Additionally, the interaction of felt competence at T1 and need for achievement was significant, $\beta = .09$, $b = .08$, $se_b = .03$, $\Delta R^2 = .01$, $t(681) = 2.53$, $p = .01$.

8.3. Longitudinal moderation analyses

Because Study 2 was designed as a longitudinal study we could also test whether increases in felt competence in conjunction with (presumably stable) need for achievement predict changes in intrinsic motivation across the semester. Therefore, we predicted intrinsic motivation at the end of the semester by controlling for intrinsic motivation and felt competence at the beginning of the semester (Step 1). Felt competence (CS) at T2 and the implicit need for achievement (ACH) were entered as Step 2 into the regression analysis followed by the CS \times ACH interaction term (Table 2). The test-retest effect of intrinsic motivation at T1, $b = .61$, $se_b = .03$, $p < .001$, as well as the main effect of need for competence satisfaction at T2, $b = .24$, $se_b = .03$, $p < .001$, were significant. Thus, enhanced competence need-satisfaction predicted enhanced intrinsic motivation, again supporting our first hypothesis. Additionally, the interaction of felt competence and need for achievement accounted for a significant amount of variance, $b = .06$, $se_b = .03$, $t(679) = 2.09$, $p < .05$. The interaction pattern is illustrated

Table 2
Hierarchical regression of intrinsic motivation at T2 (Study 2).

Step	Variable	ΔR^2	df	ΔF	b^a
1	Control variables	.44	2, 682	267.81***	
	Need for competence satisfaction, T1				.00
	Intrinsic motivation, T1				.58***
2	Main effects	.04	2, 680	26.55***	
	Need for competence satisfaction (CS), T2				.23***
	Implicit achievement motive (ACH)				.01
3	CS \times ACH	.003	1, 679	4.37*	.06*
	Cumulative R^2	.48	5, 679	127.26***	

^a b is the standardized regression coefficient in the regression equation.

* $p < .05$.

*** $p < .001$.

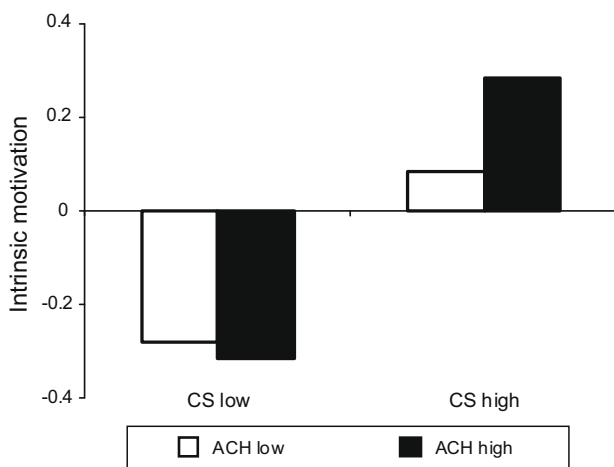


Fig. 2. Illustration of the need for competence satisfaction \times implicit achievement motive effect on intrinsic motivation (longitudinal analysis, Study 2).

in Fig. 2 and indicates that individuals with a high need for achievement reported a greater increase in intrinsic motivation from the beginning to the end of the semester when their need for competence was satisfied compared to when it was thwarted and compared to low achievement motivated individuals with high competence satisfaction.¹

9. Brief discussion Study 2

Using a larger sample and different measures of competence satisfaction and positive situational motivation, Study 2 replicated the cross-sectional moderator effects found in the first study in which the implicit need for achievement variable moderated the effect of felt competence on intrinsic motivation. The longitudinal design of Study 2 also allowed us to test the hypotheses that increased competence satisfaction from the beginning to the end of

¹ There is no clear way to examine correlated change with two-wave longitudinal designs. An alternative approach to the hierarchical regression analyses reported in the text is to compute difference scores (for a critical discussion of difference scores e.g., Willett, 1997). We computed difference scores by subtracting the T1 measures of competence satisfaction (CS) and intrinsic motivation from the T2 measures of CS and intrinsic motivation, respectively. The regression of increase of intrinsic motivation on the achievement motive (ACH) and the increase of CS (Step 1) and on the ACH \times increase of CS interaction (Step 2) revealed a significant main effect for increase of CS ($\beta = .18$, $b = .18$, $se_b = .04$, $p < .001$) and a significant interaction effect ($\beta = .08$, $b = .08$, $se_b = .04$, $t(681) = 1.91$, $p < .05$) which pattern is very similar to the one reported in the text. (Overall model: $R^2 = .04$, $F(3,681) = 8.68$, $p < .001$.)

a semester predicts increased intrinsic motivation, especially for those individuals high in the implicit need for achievement.

However, although the felt competence \times achievement motive interactions were significant, the effect sizes were smaller than in Study 1 (in Study 1 $\Delta R^2 = .04$; in Study 2 cross-sectional $\Delta R^2 = .01$; longitudinal $\Delta R^2 = .003$). One striking difference between the two studies was in the heterogeneity of the samples. Whereas in Study 1 only students of about the same age participated, the sample in Study 2 was much more diverse for instance regarding age (range from 19 to 67) and professional status (students and alumni). This may account for the smaller effect sizes. Despite these varying effect sizes, the important thing to take away is that our hypotheses received significant support in both studies.

10. Study 3

Study 1 and Study 2 confirmed the hypothesized need satisfaction \times dispositional motive interaction in the domain of sport. To demonstrate the generalizability of the moderation effect across other domains of human life, in Study 3 we asked undergraduate students about their feelings of competence in the academic domain. To further enhance generalizability, we changed the motivation measure by asking our student sample about their motivation for striving for their personal academic goals. Therefore we assessed goal commitment which is known as an effective motivational variable resulting in positive outcomes such as persistence in goal striving and well-being (Brunstein, 1993; Hollenbeck & Klein, 1987; Locke and Latham, 1990). Our assumption that need satisfaction and motive fulfillment, respectively, were not only connected to intrinsic motivation, but also to other subsequent forms of motivation to perform an activity, has been empirically supported in SDT research as well as in dispositional motive approach research. SDT researchers found for example that intrinsic need-satisfaction predicted job-related motivation as the time spent at work (Kasser, Davey, & Ryan, 1992). Dispositional motive researchers showed for example that individual motive differences predicted absenteeism from work (Hackman & Lawler, 1971). Additionally, researchers of both approaches showed that need satisfaction is associated with performance, as for example performance ratings at work (Baard et al., 2004), managerial effectiveness (McClelland & Burnham, 1976) and work quality (Hackman & Lawler, 1971).

Transferred to student's academic goals, we examined goal commitment as a subsequent motivation measure and perceived goal progress as a performance measure. We expected that feeling competent results in higher academic goal commitment and goal progress (hypothesis 1). Additionally we hypothesized that this relationship is moderated by the strength of the implicit achievement motive as assumed in Study 1 and Study 2 (hypothesis 2).

11. Method Study 3

11.1. Participants and procedure

One-hundred and six students of the University of Osnabrueck, Germany, were invited to participate in a longitudinal study about "personality and goals." At the beginning of the semester (T1) participants completed the implicit need for achievement measure and named and described six personal goals in a questionnaire at home. Due to practical reasons the baseline measures of need for competence satisfaction, goal commitment and goal progress took place seven weeks later (T2, middle of semester). At the end of semester (again 7 weeks later; T3) participants rated their competence need satisfaction, their current goal commitment and their goal progress for a second time. Fifty-eight undergraduate students

(45 female; age: $M = 23.97$, $SD = 4.90$) completed all three parts of the survey and their data sets were included in the analyses reported below. These 58 participants did not differ in any variable measured at T1 from the 48 participants that decided to quit. The participation in the study was paid with 30€ or course credit.

11.2. Measures

Competence need satisfaction was measured by the daily activity-based methodology used by Sheldon, Ryan, & Reis et al. (1996; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). This methodology focuses participants upon the 24 h previous to the assessment rather than on life in general at the time of assessment. In the present research we assessed participants' goal-related activities on three different days during the semester, as random samples of their typical goal-related activities during the semester. This more molecular focus likely explains the low test–retest coefficients observed.

The *implicit need for achievement* was again measured using the Multi-Motive-Grid (MMG; Sokolowski et al., 2000) and again showed adequate reliabilities (Cronbachs' Alpha for HS: .67; FF: .72; overall score after recoding the fear-of-failure items: .66; Pearson correlation HS and FF = .06, *ns*).

11.3. Commitment to achievement goals

At time 1 (T1), participants were asked to freely list six personal goals they want to strive for in the next months. Participants listed goals in different domains, for example leisure time goals, sport goals and academic goals. The scoring of the achievement goals was based on the coding system proposed by Kuhl and Scheffer (1999). It was carried out by a well-trained psychologist who had reached high reliability with other coders in prior studies. Achievement goal commitment was assessed at the middle (T2) and the end of the semester (T3) by averaging, across the participants' coded achievement goals, ratings of the six commitment items (e.g. "No matter what happens, I will not give up this goal" used by Brunstein (1993; Brunstein et al., 1998). The items had to be rated using a 7-point scale from (1) I completely disagree to (7) I completely agree (7). Cronbachs' Alpha in this study was .77 at T2 and .81 at T3.

Progress in achievement goals was assessed simultaneously with goal commitment in a manner similar to Brunsteins' (1993; Brunstein et al., 1998) procedure in which six items of the subscales advancement, outcome and obstacles were computed to a goal progress score (item example: "I have made a great deal of progress in the attempt of advancing this goal"). The items had to be rated using a 7-point scale ranging from (1): I completely disagree to (7): I completely agree. Cronbachs' Alpha in this study was .79 at T2 and T3.

12. Results Study 3

12.1. Preliminary analyses, descriptive statistics and correlations

Preliminary *T*-tests revealed that women and men did not differ in any of the assessed variables. Also participant's ages did not influence the results reported below. Table 3 shows descriptive statistics and correlations among the variables of Study 3. The goal variables were positively related and felt competence correlated significantly with achievement goal progress measured at T3.

12.2. Cross-sectional moderation analyses

In order to test the cross-sectional moderation effect on goal commitment at the end of the semester we entered T3 competence satisfaction at T3 (CS) and the implicit achievement motive (ACH) as a first step into the regression equation, followed by the CS at T3 \times ACH interaction term (Step 2). The main effect of felt competence at T3 reached significance, $\beta = .27$, $b = .26$, $se_b = .13$, $p < .05$. Additionally, the CS at T3 \times ACH interaction predicted goal commitment, $\beta = .37$, $b = .41$, $se_b = .15$, $\Delta R^2 = .12$, $t(54) = 2.82$, $p < .01$. The overall model was significant, $R^2 = .16$, $F(3,54) = 3.29$, $p < .05$. The interaction pattern was similar to that of Study 1 and Study 2: High need for achievement participants reported stronger goal commitment than individuals low in the need for achievement when their need for competence was satisfied. They also showed stronger goal commitment when they experienced competence rather than when they did not felt competent.

A parallel analysis was conducted with the variables at the first time of data collection (Step 1: CS at T2 and ACH; Step 2: CS at T2 \times ACH; DV: goal commitment at T2). Although on a descriptive level the CS at T2 \times ACH interaction was similar to the interaction pattern revealed for the variables at the end of the semester, it was weaker and failed to reach significance, $\beta = .22$, $b = .17$, $se_b = .10$, $\Delta R^2 = .05$, $t(54) = 1.64$, $p = .11$ (overall model: $R^2 = .07$, $F(3,54) = 1.35$, *ns*).

The same strategy of data analysis was conducted to predict goal progress. First, it was tested whether the main effects of need for competence at the end of the semester and the implicit achievement motive (Step 1) and the interaction of CS at T3 \times ACH (Step 2) predicted goal progress at T3. Competence satisfaction at T3 ($\beta = .39$, $b = .39$, $se_b = .13$) as well as the CS \times ACH interaction significantly predicted goal progress, $\beta = .32$, $b = .36$, $se_b = .15$, $\Delta R^2 = .09$, $t(54) = 2.44$, $p < .05$ (overall model: $R^2 = .19$, $F(3,54) = 4.16$, $p < .05$). The interaction pattern was similar to that for goal commitment at T3. Again, a parallel analysis was conducted with the variables at the first time of data collection (Step 1: CS at T2 and ACH; Step 2: CS at T2 \times ACH; DV: goal progress at T2). Equally to the analyses at the beginning of the semester, a main effect for CS at T2 revealed, $\beta = .20$, $b = .19$, $se_b = .12$, $p < .05$. The significant CS at T2 \times ACH interaction ($\beta = .39$, $b = .27$,

Table 3
Descriptive statistics and correlations (Pearson correlation) among variables of Study 3.

		1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>
1	Implicit achievement motive	1	.10	.04	-.05	-.10	-.03	.13	3.57	4.26
2	Need for competence satisfaction, T2		1	.11	-.15	.07	.19	.16	5.14	0.88
3	Need for competence satisfaction, T3			1	.03	.14	.10	.29*	5.37	0.91
4	Commitment to achievement goals, T2				1	.65***	.53***	.41**	32.64	5.26
5	Commitment to achievement goals, T3					1	.52***	.68***	30.35	5.80
6	Progress of achievement goals, T2						1	.66***	11.77	6.38
7	Progress of achievement goals, T3							1	13.57	6.52

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4
Hierarchical regression of goal commitment (longitudinal, Study 3).

Step	Variable	ΔR^2	df	ΔF	b^a
1	Control variables	.45	2, 55	22.51***	
	Need for competence satisfaction, T2				.19
2	Commitment, T2				.63***
	Main effects	.02	2, 53	.93	
	Need for competence satisfaction (CS), T3				.21*
	Implicit achievement motive (ACH)				-.10
3	CS \times ACH	.08	1, 52	9.42**	.31**
	Cumulative R^2	.51	5, 52	12.72***	

^a b is the standardized regression coefficient in the regression equation.

* $p < .05$.

** $p < .001$.

$se_b = .10$, $\Delta R^2 = .14$, $t(54) = 3.02$, $p < .001$) showed a very similar pattern as for the interaction at the end of the semester (overall model: $R^2 = .18$, $F(3,54) = 3.86$, $p < .05$).

12.3. Longitudinal moderation analyses

In order to test for the longitudinal effects on goal commitment, we controlled for goal commitment at T2 and competence satisfaction at T2 (Step 1) and entered competence satisfaction (CS) at T3 and implicit achievement motivation (ACH) as Step 2 into the regression analysis followed by the CS (at T3) \times ACH interaction term (Step 3) (Table 4). The test–retest effect of goal commitment at T2, $b = .61$, $se_b = .09$, $p < .001$ as well as the main effect of competence satisfaction at T3 were significant, $b = .20$, $se_b = .10$, $p < .05$. Additionally, the CS \times ACH interaction was significant, $b = .34$, $se_b = .11$, $t(52) = 3.07$, $p < .01$. Fig. 3 illustrates that participants with a high need for achievement who felt increased competence reported more increased goal commitment compared to high achievement motivated individuals with low need for competence satisfaction and compared to individuals low in the need for achievement who also reported need for competence satisfaction. Unexpectedly, low achievement motivated individuals reported stronger goal commitment when experiencing low rather than high need for competence satisfaction.

An analogous analysis with goal progress as the dependent variable (Step 1: goal progress at T2, CS at T2; Step 2: CS at T3, ACH;

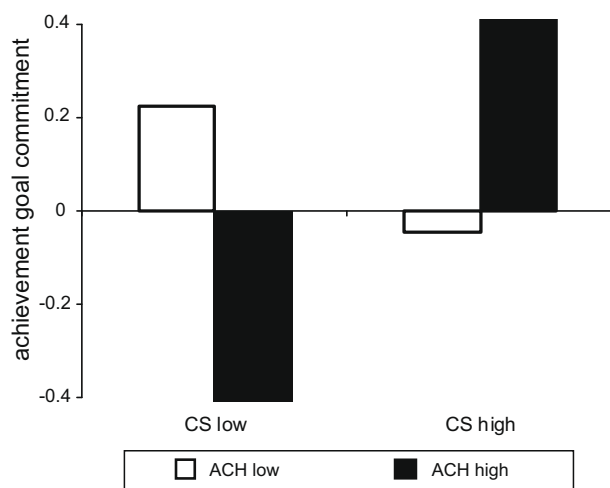


Fig. 3. Illustration of the need for competence satisfaction \times implicit achievement motive effect on goal commitment (longitudinal analysis, Study 3).

Step 3: CS at T3 \times ACH) showed that goal progress at T2, $\beta = .61$, $b = .64$, $se_b = .10$, $p < .001$, as well as competence satisfaction at T3, $\beta = .29$, $b = .29$, $se_b = .10$, $p < .01$, predicted goal progress at T3. Additionally, the CS \times ACH interaction reached significance, $\beta = .21$, $b = .24$, $se_b = .11$, $t(52) = 2.07$, $p < .05$, indicating, that participants with a high need for achievement reported more goal progress from the beginning to the end of the semester than individuals low in the achievement motive, but only when their competence need-satisfaction scores increased. The interaction pattern was very similar to the interaction pattern of goal commitment. The overall hierarchical regression model was significant, $R^2 = .55$, $F(5,53) = 12.47$, $p < .001$ (R^2 of Step 1: .44, Step 2: .07, Step 3: .04; ΔF of Step 1: 21.51, $p < .001$, Step 2: 3.70, $p < .05$, Step 3: 4.29, $p < .05$).²

13. Brief discussion Study 3

Study 3 again confirmed the hypothesis that the satisfaction of the need for competence is beneficial for motivation, this time for participants' commitment to their achievement goals. Additionally we showed that competence satisfaction is also related to a performance measure, in this study operationalized as goal progress. In accordance with our hypothesis, high achievement motivated individuals reported high goal commitment and goal progress when their need for competence was satisfied and they reported low commitment and progress when they did not feel competent. Notably, although Studies 1 and 2 found a directionally similar (but weaker) effect of competence feelings on motivation for those low in need for achievement, Study 3 found a weak crossover effect such that low achievement motivated individuals reported somewhat more (rather than somewhat less) goal commitment and progress when their competence need was not satisfied. It is possible this difference is due to the goal-assessment methodology used in Study 3, which perhaps activated participant's self-concepts and self-presentational concerns to a greater extent than the course assessment methodologies used in Studies 1 and 2. Although further research is needed here as well, we note that our perspective merely predicts that competence feelings have significantly more positive effects for high versus low achievement-oriented people (which we found), not that competence always has positive effects.

14. General discussion

Hoping to better understand the determinants of situational motivation, the present research took a new approach to the topic of psychological needs. Specifically, we tried to integrate the self-determination theory (Deci & Ryan, 2000) and motive disposition theory perspectives on needs (e.g., McClelland, 1985) in order to understand "what gets people going." Focusing on the achievement domain, we first wanted to replicate the well-documented positive relationship between felt competence and positive situational motivation. However, we also hypothesized that people high

² As in Study 2 we computed difference scores. A hierarchical regression analysis with ACH and increase of CS as Step 1 and the ACH \times increase of CS interaction as Step 2 in the regression equation revealed a marginal main effect for increase of CS ($\beta = .23$, $b = .22$, $se_b = .12$, $p < .10$) and a significant interaction effect, $\beta = .29$, $b = .29$, $se_b = .13$, $t(52) = 2.20$, $p < .05$ when predicting increase in goal progress (overall model: $R^2 = .16$, $F(3,54) = 3.39$, $p < .05$). The interaction pattern is parallel to the results we reported in the text. However, a hierarchical regression analysis of increase of goal commitment revealed neither a significant main effect for increase of CS ($\beta = -.10$, $b = -.10$, $se_b = .13$) nor a significant ACH \times increase of CS interaction effect, $\beta = .11$, $b = .11$, $se_b = .14$, $t(52) = .77$, ns . (overall model: $R^2 = .03$, $F(3,54) = 0.47$, ns). The fact that the ACH \times increase of CS interaction was not significant in the difference score analysis suggests that the goal commitment finding should be treated more cautiously. However, it is also possible that problems with difference scores account for the non-significant effect (see Cohen et al., 2003, p. 570).

in the need for achievement get more out of feeling competent than people low in the need for achievement. Three studies in different domains of human life confirmed our hypotheses, showing that individuals high in the need for achievement reported higher flow experience (Study 1), higher intrinsic motivation (Study 2), higher commitment to their goals (Study 3) and more goal progress (Study 3), when they experienced competence compared to when they did not experience competence and than individuals low in the need for achievement. Conversely, individuals high in the need for achievement suffered more from the frustration of the need for competence, reporting lower flow experience, intrinsic motivation, goal commitment and goal progress compared to individuals low in the need for achievement. Thus, our basic prediction, that competence satisfaction would have different effects for those low and high in the achievement motive, was confirmed in every study; further research will be needed to explain the small variations on this pattern across studies.

Importantly, there were no main effects of the need for achievement – just because a person is oriented in this direction does not mean they automatically thrive in that domain. Feelings of concrete competence are required to jump-start the process.

The results reconfirm the universalistic assumptions of SDT, by showing the typical main effect of felt competence upon positive outcomes. However the results also newly confirm the individual difference assumptions of motive disposition theory, by showing that those more oriented towards a particular motive domain (here, achievement) are more affected by domain-relevant need satisfaction (here, competence). The latter result supports Vallerand's (2000) commentary arguing that individual differences can moderate basic need effects, and belies Deci and Ryan's (2000) suggestion that this may not a fruitful place to focus research. However the findings also support Deci and Ryan's (2000) argument that if individual differences in needs are to be considered, they should be measured via implicit (projective) rather than by explicit (self-report) methodologies. In Study 1, we found that an explicit need for achievement measure did not moderate the competence effect, whereas in all three studies, an implicit need for achievement measure did have such effects.

In one sense, these results support a conventional “matching” perspective which says that people benefit from getting what they want, or what matches their personality (Harackiewicz & Sansone, 1991; Vansteenkiste, Matos, Lens, & Soenens, 2007). However, the matching had to occur between an implicit and an explicit measure (of need for achievement and felt competence, respectively), rather than between two explicit measures. This suggests that it may be more important to get what matches your deeper personality, than what matches your explicit beliefs about yourself or what matches what you think you want. To provide a way of considering the nature of “deeper personality,” Sheldon (2004, 2007) proposed a multi-level model of personality (see also McAdams, 1996) which distinguished between self-concepts and self-narratives at level 4, current goals and projects at level 3, dispositional signatures (stable traits, interests, and inclinations that vary across people) at level 2 and basic needs (evolved experiential requirements for all people) at level 1. Basic needs, which are species-typical and which exist “beneath” individual differences, and dispositional characteristics (including need for achievement), which represent enduring core features of different personalities, may both be construed as “deep” aspects of personality. In the current data, feelings of competence need satisfaction were particularly beneficial for people when the activity (sports or academics) mapped onto their “deeper” (implicit) motive for achievement. This finding is also consistent with Sheldon's (2004, 2007) claim that higher levels of personality can have top-down moderator effects upon constructs at lower levels of personality. The results of these studies showing that

motive dispositions (level 2) moderated the effects of basic needs (level 1) are consistent with Sheldon's proposals.

In principle, the results we have reported should apply to other motive dispositions besides achievement, other life-domains besides sport and student's goals, and other basic psychological needs besides competence. For example, we would predict that those high in the need for affiliation would benefit more from feelings of relatedness, and suffer more from feelings of non-relatedness. What about the need for autonomy, the third basic need specified by SDT? This question is more difficult, because the need for autonomy does not have a clear analog in the motive disposition literature. The need for power is the other main motive within this literature, but the need for power does not map cleanly onto the need for autonomy. Although *power over oneself* (“autonomy” in a broader sense) is mentioned as an early stage in McClelland's (1975) developmental stages of power orientations, most motive researchers regarded the need for power as the desire to *influence others* in order to feel strong (higher stage in McClelland's stage model) (Langan-Fox & Grant, 2007; Lewin, 1951: the power of B over A, p. 336; Sokolowski & Kehr, 1999; Winter, 1973). In contrast, the need for autonomy reflects the individual's need to experience self-determination and self-governance rather than feeling governed by others (e.g., Deci & Vansteenkiste, 2004). Thus, the need for power and the need for autonomy seem to represent concepts that have different foci. In any case, our perspective would predict that those higher in an implicit disposition to be self-determining, if an appropriate measure existed, should benefit more from feelings of situational autonomy. This idea remains to be tested, however.

The idea that individual differences may moderate basic need satisfaction effects suggests interesting directions for future SDT research. For example, although an impressive number of studies showed that environments supporting autonomy, competence and relatedness needs positively affect participants' well-being and motivation (e.g., Baard et al., 2004; Deci & Ryan, 2000) there is still non-explained variance that is worth focusing on. We suggest that this non-explained variance is partly traced back to individuals who benefit to a lower degree from environments or interventions aiming at supporting, for example, autonomy or competence needs. Perhaps, due to their high need for affiliation or intimacy, some individuals would benefit more from an environment supporting felt relatedness. Future research is needed to test whether the efficacy of interventions that aim at improving participants' psychological well-being through satisfaction of basic needs can be improved by tailored interventions that better match with participant's individual motives.

Research is also needed to address further theoretical questions suggested by the present research and to overcome some methodological limitations of our studies. For example, it would be interesting to test whether the reported effects also hold for different samples, e.g. for non-Western individuals and for non-students. From a methodological point of view it would be interesting to analyze causality rather than interpreting correlated change in the longitudinal analyses. It would be elegant to show that experimentally manipulated need satisfaction differs in its effect on subsequent motivation in dependence of participant's need strength. Furthermore, it could be examined whether the need satisfaction \times dispositional motive interaction also influences other positive outcome variables as psychological adjustment and physiological well-being.

One important question, not answered by these data, concerns the real meaning of the term “psychological need,” a term that is employed by both theoretical perspectives. What are we to make of this overlapping usage? We suggest there are two possible interpretations of the situation. The first is that both theories address the same phenomena. If this is the case, however, then logical

problems arise, because SDT and motive disposition theory make very different assumptions about this single phenomenon (that needs are universally and equally required by all, versus that there are large individual differences in needs; that needs function as experiential rewards for adaptive behavior, versus that needs function as motives impelling behavior). This would suggest that the two theories are ultimately incompatible and that one must be incorrect. The second interpretation of the situation is that the two theories address different phenomena, but by the same name (psychological needs). This would suggest that the two theories can harmoniously co-exist, once the terminological confusion has been dispensed.

Our empirical data support some combination of these two interpretations. The “needs,” measured by two very different methodologies, had synergistic interactions with each other – thus competence need satisfaction and need for achievement are not simply the same construct. However, they must still be similar in some way, because of their similar thematic focus on competence and achievement. We suggest the following resolution: although all people have the same basic needs, people might acquire different amounts of an implicit tendency to approach particular types of basic need satisfactions, perhaps as a function of their developmental history. For example, someone who frequently experiences relatedness and communion as a child may become especially sensitized to this dimension of experience, and thus may become skilled at creating further such experiences for herself. As another example directly relevant to this paper, a child who has many early competence experiences (perhaps because of child rearing practices that emphasize engagement and effectance within moderately difficult tasks) will develop a strong need for achievement; the positive affect and reinforcement associated with such natural incentives might result in a dispositional sensitivity to respond to competence experiences (see McClelland et al., 1989 for a review).

Returning to SDT: If we view autonomy, competence, and relatedness not only as required experiences that people need to have, but also as affectively-tinged natural incentives that may be cued or supported by the environment, then it is logical that some childhood environments may produce a more developed response to one type of need than to another. To use a more concrete analogy, although everyone needs food, some epicures might become particularly sensitized to the food need and especially benefit from and appreciate an exceptional meal. In one sense this reconciliation of motive disposition theory and SDT is compatible with Ryan and Deci's (2000) conceptualization of motives as individual differences in motivational orientations that “result from the interaction of the basic needs with the social world” (Deci & Ryan, 2000, p. 232).

In conclusion, we suggest that the current research makes an excellent beginning towards an overdue integration of SDT and motive disposition theory, the two most prominent approaches to psychological needs, combining the main tenets of both theories to optimize the prediction of situational motivation.

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